2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 PROPOSED FACILITIES

SES proposes to construct and operate an LNG import, storage, and vaporization terminal on a 25-acre site on a portion of Pier T, designated Berth T-126, on Terminal Island within the POLB, Los Angeles County, California (see figure 2.1-1). The import terminal would deliver an average of 700 million standard cubic feet per day (MMscfd) of natural gas with a peak capacity of 1 Bscfd to the existing SoCal Gas pipeline system via a new 2.3-mile-long, 36-inch-diameter natural gas pipeline that would be constructed and operated by SES. In addition, a portion of the LNG would be distributed via trailer trucks to LNG vehicle fueling stations throughout southern California to fuel LNG-powered vehicles. Up to 10,000 MMBtu per day of C_2 recovered from the LNG would be vaporized and distributed to the existing LARC via a new 4.6-mile-long, 10-inch-diameter pipeline that would be constructed and operated by ConocoPhillips. Power to the LNG terminal would be supplied via 0.8 mile of electric distribution lines and a new substation that would be constructed and operated by SCE. The proposed LNG terminal and associated facilities are described below.

2.1.1 LNG Terminal Facilities

The LNG terminal facilities would include:

- a 1,100-foot-long LNG ship berth and unloading facility with unloading arms, mooring and breasting dolphins, and a fendering system that would be capable of unloading one ship at a time;
- two LNG storage tanks, each with a gross volume of 160,000 cubic meters (1,006,000 barrels) surrounded by a security barrier wall;
- 20 electric-powered booster pumps;
- four shell and tube vaporizers using a primary, closed-loop water system;
- three boil-off gas compressors, a condensing system, an NGL recovery system, and an export C_2 heater;
- an LNG trailer truck loading facility with a small LNG storage tank;
- a natural gas meter station and odorization system;
- utilities, buildings, and service facilities; and
- associated hazard detection, control, and prevention systems; site security facilities; cryogenic piping; and insulation, electrical, and instrumentation systems.

The general layout of the proposed LNG terminal facilities is provided on figure 2.1.1-1. A conceptual process flow diagram showing the general operation of these facilities is shown on figure 2.1.1-2.

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FOR THE
LONG BEACH LNG IMPORT PROJECT

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Figure 2.1-1

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Figure 2.1.1-1

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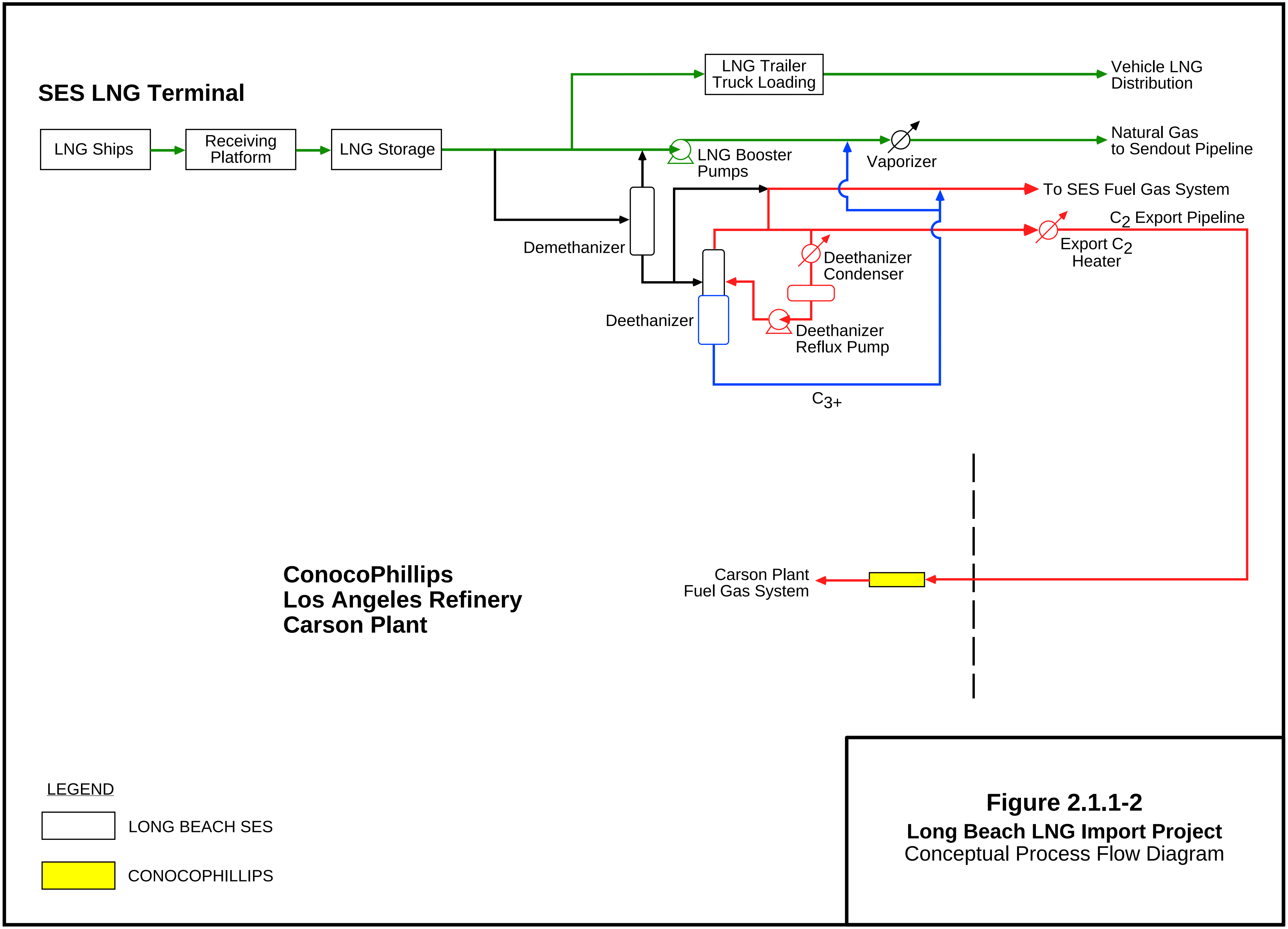


Figure 2.1.1-2
Long Beach LNG Import Project
Conceptual Process Flow Diagram

The proposed site for the terminal facilities, which was formerly part of a naval shipyard, is currently paved with concrete and asphalt and contains two abandoned buildings. The POLB would demolish the buildings on the site and remove the pavement prior to SES' initiation of activities associated with the proposed project. The environmental impact analysis for the demolition activities was conducted as part of the EIS/EIR prepared for the disposal and reuse of the naval complex (Department of the Navy/City of Long Beach, 1998); therefore, those activities are not addressed in this EIS/EIR. The other activities associated with the project that would be conducted by the POLB (see discussion below) are addressed in this EIS/EIR.

The existing shoreline structures consist of a cellular steel sheet pile bulkhead along the south side of the site and a rock dike with a pile-supported concrete wharf along the west side of the site. The POLB would reinforce or replace these structures as needed to support the upland loads generated by the LNG storage tanks and other heavy load structures.

2.1.1.1 Ship Berth and Unloading Facility

The proposed ship berth and unloading facility would be designed to handle ships with a capacity ranging from 75,000 cubic meters and an overall length of 844 feet to a capacity of 208,000 cubic meters and an overall length of 1,115 feet. The typical ship size would be between 125,000 and 165,000 cubic meters. LNG vessels of this size would typically have a total length of 950 to 1,000 feet, a beam (width) of about 150 feet, and a loaded draft of about 40 feet. The facility would be capable of mooring and unloading one LNG ship at a time. SES anticipates that up to 120 ships per year would unload LNG at the proposed facility.

The ships would enter the area through Queens Gate, a 1,200-foot-wide opening into San Pedro Bay between the Long Beach and Middle breakwaters. To access Pier T, the vessels would travel northwest within the Long Beach Main Channel into the Middle Harbor. Pier T is located within the West Basin of the Middle Harbor.

The current water depth at Pier T-126 ranges from 46 feet to 53 feet below mean lower low water (MLLW). Preparation of the berth would require the dredging of approximately 175,000 cubic yards of sediments to a depth of about -55 feet MLLW to accommodate safe under keel clearance and tidal fluctuation. This depth would accommodate the largest LNG ships expected to use the terminal. Sediment sampling in the West Basin has indicated that there are chemically impacted sediments present and the West Basin of Long Beach Harbor is designated as Installation Restoration (IR) Site 7. The POLB has recently negotiated a consent agreement with the California Department of Toxic Substances Control (DTSC) for its concurrence with the IR Site 7 sediment remediation. A portion of IR Site 7 is adjacent to Berth T-124, at the southern end of the project site, and at Berth T-126, which is the berth proposed for the Long Beach LNG Import Project (see figure 2.1.1-1). Accordingly, the dredging associated with the proposed project would be done only with the concurrence of the DTSC and in accordance with permits issued by the ACOE and the RWQCB (see section 4.2.3). The dredged area for the ship berth would be about 200 feet wide by 1,150 feet long. The POLB would conduct the dredging and dispose of the dredged material at an approved site within the Port.

The ship berth and unloading facility would consist of a pile-supported concrete unloading platform, multiple mooring and breasting dolphins, and a fendering system. The unloading platform would be capable of accommodating up to five unloading arms with their associated hydraulic control system, associated piping, utilities, fire protection equipment, and a gangway tower. A trestle would provide access to the unloading platform from shore. The trestle would consist of a roadway of sufficient width for one lane of traffic as well as all piping, utilities, and fire projection equipment. The POLB would be responsible for the engineering design and construction of the structural and in-water portions of the ship berth and unloading facility; SES would be responsible for the engineering design and construction of the LNG transfer and associated facilities.

The mooring and breasting dolphins would be constructed on either side of the unloading platform to provide the means to secure the vessel. The dolphins would be constructed of reinforced concrete slabs supported on piles and would include fenders against which the vessel would be berthed. The dolphin elevation would be approximately +15.5 feet MLLW and each structure would include mooring line release hooks and a high capacity fender system. A computer system would be installed to monitor the unloading process and all safety alarms.

SES' proposal includes on-board ship pumps running on LNG boil-off gas or residual fuel oil to deliver the LNG to the LNG storage tanks. A total of four marine unloading arms would be installed on the unloading platform, three for liquid delivery to the storage tanks and one for use in vapor return to the ship. Space would also be provided for potential future installation of a fifth arm, which would increase unloading capacity and flexibility. The unloading arms would be designed with swivel joints to provide the required range of movement between the ship and the shore connections and would be able to withstand wind speeds up to 150 miles per hour (mph). Each arm would be fitted with powered emergency release coupling (PERC) valves to protect the arm and avoid spillage of its liquid contents. The unloading platform would be curbed to confine LNG spillage and its surface would be sloped to direct drainage from the platform to the LNG storage tank area containment system via a trough (see section 2.7.1.1). It would take approximately 12 hours to unload one LNG ship of typical size.

The marine facilities would be designed to provide a safe berth for the receipt and support of LNG ships and to ensure the safe transfer of LNG from the ships to onshore storage facilities. Design would be in accordance with applicable codes and standards, including but not limited to the Oil Companies International Marine Forum (OCIMF), Society of International Gas Tanker and Terminal Operators (SIGTTO), American Petroleum Institute (API), and American Society of Civil Engineers (ASCE). In this regard, SES has consulted extensively with the Coast Guard, Jacobsen Pilot Services, Inc. (Jacobsen Pilots), the Marine Exchange, the Los Angeles/Long Beach Harbor Safety Committee (HSC), and local law enforcement.

The marine facilities would also be designed to current POLB design criteria for shoreline structures and in accordance with the California Code of Regulations Marine Oil Terminal Engineering and Maintenance Standards. These standards provide structural loading criteria for marine structures including dead and live loads, earthquake loads, mooring and berthing loads, influence from passing vessels, wind and current loads, load combinations, and safety factors.

A discussion of design and safety features of LNG ships is presented in section 2.1.2.

2.1.1.2 LNG Storage Tanks

LNG unloaded from the ships would be stored in two 160,000 cubic meter (1,006,000 barrel) full containment storage tanks at a normal pressure of 1 to 3 pounds per square inch gauge (psig). Each tank would have a primary 9 percent nickel-steel inner container and a secondary pre-stressed concrete outer container wall, a reinforced concrete outer container bottom, a reinforced concrete domed roof, and an aluminum insulated support deck suspended from the outer container roof over the inner container (see figure 2.1.1-3). The double-walled tanks are designed, and would be constructed, so that both the primary container and the secondary container could independently contain the stored LNG. The primary container would contain the cryogenic liquid under normal operating conditions. The secondary container is capable of containing the cryogenic liquid and of controlling vapor resulting from product release from the inner container. The diameter of the outer containers would be approximately 255 feet and the height to the top of the storage tank domes would be approximately 176 feet.

The space between the inner container and the outer container would be insulated to allow the LNG to be stored at a temperature of -260 °F while maintaining the outer container at near ambient temperature. The insulation under the inner container's bottom would consist of a cellular glass block. The outer concrete container above the approximately 15-foot-high thermal corner protection system would be lined on the inside with carbon steel plates. This carbon steel liner would serve as a barrier to moisture migration from the atmosphere reaching the insulation inside the outer container. This liner also would form a barrier that prevents vapor from escaping from inside the tank during normal operations. All piping into and out of the tank would enter from the top of the tank (i.e., there would be no penetration through the side or bottom of the tank).

The foundations for the storage tanks would be supported on driven steel piles. A reinforced concrete base slab foundation would be constructed on the piles on which the LNG storage tanks would be built with seismic isolators or a flexible foundation to reduce horizontal seismic load (see figure 2.1.1-3).

The area around the storage tanks would be graded so that any spill of LNG would flow to a containment sump system. The containment sump system and both LNG storage tanks would be inside an approximately 20-foot-high concrete security barrier wall that would prevent LNG escape and restrict LNG vapors during potential LNG spills. Additional discussion of the containment system is presented in section 2.7.1.1.

2.1.1.3 Vaporization System

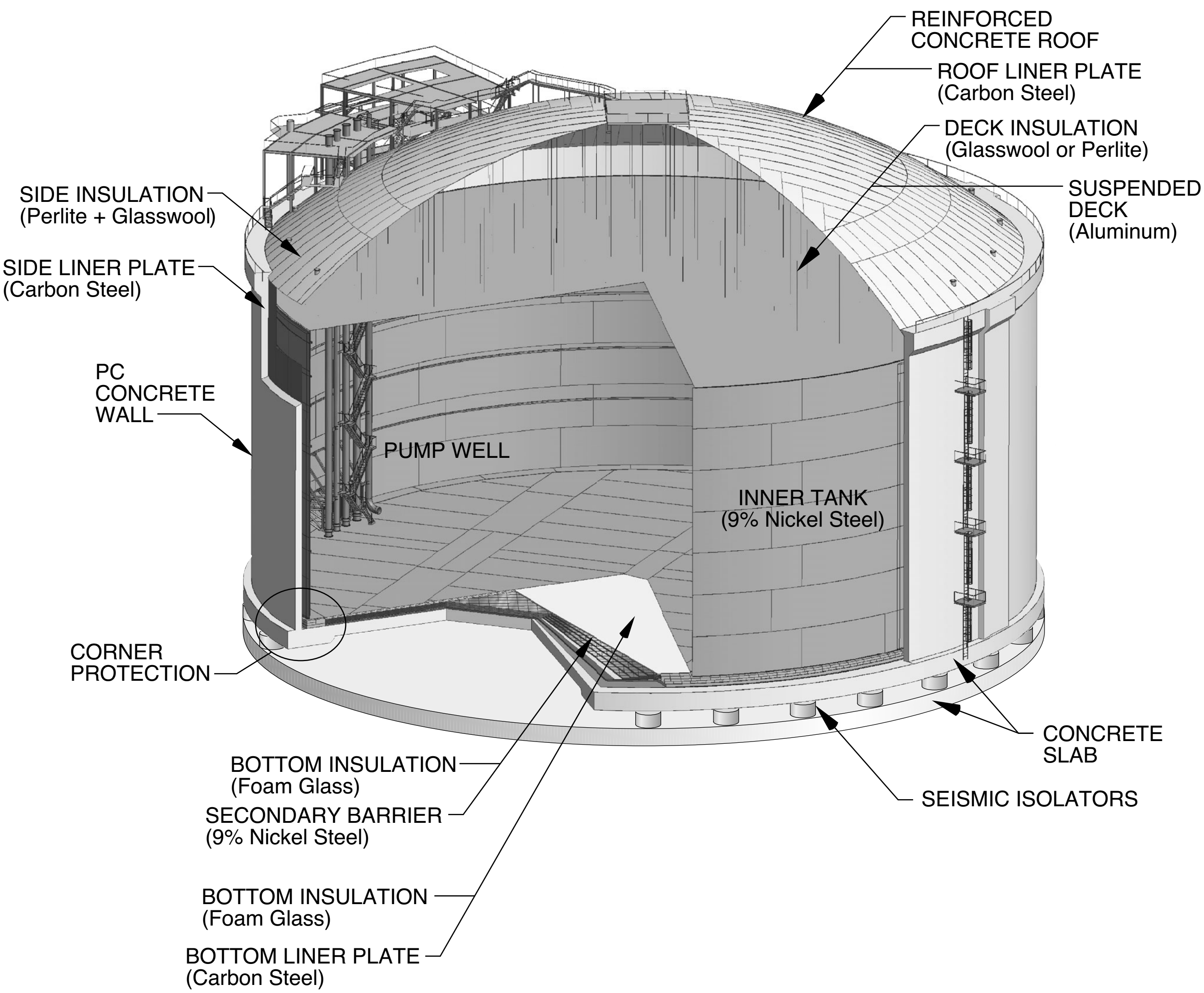
LNG would be pumped from the storage tanks to the vaporizers for sendout to the pipeline. Three closed-loop vertical shell and tube heat vaporizers, plus a spare, would be used to vaporize the LNG. Each vaporizer would be capable of vaporizing approximately 350 MMscfd of LNG. This process would involve warming the LNG and converting it back to a gaseous state. Heat for the process would be provided by three direct-fired heaters using 100,000 gallons of deaerated fresh water purchased from a local supplier. Another 10,000 gallons of deaerated fresh water would be stored in a tank to be used as makeup water for the closed-loop system. No by-products would be generated or discharged by the system.

The pumps and vaporizers would be installed within curbed spill collection areas. Drainage from these collection areas would be conveyed through LNG spill collecting troughs to a containment sump system (see section 2.7.1.1).

2.1.1.4 Vapor Handling System

During normal operation, ambient heat input into the LNG storage tanks would cause a small portion of the stored LNG to be vaporized, commonly referred to as boil-off gas. SES' vapor handling system would condense the vapor and combine it back with the LNG.

In order to maintain the ship tanks' pressure and system equilibrium, a portion of this vapor would be returned to the ship during ship unloading to compensate for the volume of liquid pumped out of the ship into the onshore LNG storage tanks. The boil-off gas compressors would be designed to handle the vapor, which would be either returned to the ship or sent to the recondenser.



NOTE: APPROVED DESIGN WOULD INCLUDE EITHER SEISMIC ISOLATORS OR A FLEXIBLE FOUNDATION TO REDUCE HORIZONTAL SEISMIC LOAD.

Figure 2.1.1-3

Long Beach LNG Import Project

Conceptual Design of LNG Storage Tanks

2.1.1.5 Natural Gas Liquids Recovery System

Natural gas is a mixture of hydrocarbon compounds, principally methane. It also contains small amounts of heavier hydrocarbons, such as propane, C_2, and butane, which have a higher heating value than methane. A portion of these components may need to be removed from the LNG that would be stored on the terminal site in order for the natural gas to meet the Btu and gas quality specifications of SoCal Gas as well as the specifications for LNG vehicle fuel established by the CARB. The components that are removed are called NGL. Accordingly, LNG that does not meet the required specifications would be routed through the NGL recovery unit. The NGL recovery facilities would consist of a demethanizer extraction column to extract the heavier hydrocarbons from the methane and a deethanizer extraction column to separate the C_2 and propane and heavier hydrocarbons (C_{3+}). The same heated water used in the vaporizers would also be used as the heat transfer fluid to supply heat necessary for the extraction column reboilers in the NGL recovery unit. The general operation of the NGL recovery system is shown on the conceptual process flow diagram depicted on figure 2.1.1-2.

As shown on figure 2.1.1-2, the C_2 extracted from the LNG in the NGL recovery unit would be used as fuel gas within the terminal and/or vaporized and transported via the proposed C_2 pipeline to the existing LARC and subsequently used as fuel gas or feedstock. The amount of C_2 available for sendout would depend on the Btu content of the LNG cargoes but would not exceed 10,000 MMBtu per day, which is the amount that can be handled at the LARC without requiring any new processing or storage facilities. The C_{3+} extracted from the LNG in the NGL recovery unit would be used as fuel gas within the LNG terminal, primarily to fire the water heaters.

A portion of the LNG from the NGL recovery system would be sent to the LNG trailer truck loading facility where it would be further processed and recondensed to produce vehicle fuel grade LNG (see section 2.1.1.6).

2.1.1.6 LNG Trailer Truck Loading Facility

After the LNG has been processed to meet LNG vehicle fuel quality specifications, it would be stored in a trailer truck loading facility at the LNG terminal. The trailer truck facility would consist of a 3,800 cubic meter (23,901 barrels) full containment storage tank and two trailer truck loading bays. SES anticipates that an average of 16 trailer trucks would be loaded per day to transport LNG to LNG vehicle fueling stations throughout southern California. Refer to section 4.7.2.2 for a discussion of LNG trailer truck traffic.

The area around the trailer loading facility would be curbed and graded so that a spill would flow to a containment sump system (see section 2.7.1.1).

2.1.1.7 Other Facility Components

Electrical System

The project power supply would be purchased from SCE, which is the local public electric power supplier (see section 2.1.4). Emergency power would be provided by a backup internal combustion engine generator. An uninterruptible power supply system would be provided and the plant electrical system would be furnished with automatic start and transfer devices to ensure that a loss of power would immediately start the emergency power generator.

Water System

Hot water would be used as an intermediate heat transfer fluid to supply heat for LNG vaporization and to the NGL recovery unit extraction columns. A closed circulating system would be used where the water would be pumped through heating coils in a fuel-gas-fired furnace prior to delivery to the LNG vaporizers as well as the NGL recovery unit. A 10,000-gallon storage tank would be provided to store the deaerated water that would be used, as necessary, as makeup water for the closed loop system. Potable water would also be used for various utilities such as firewater, hose stations, and use in the buildings' lavatories.

2.1.2 LNG Ships

LNG could be shipped from a variety of sources around the world, including Algeria, Australia, Brunei, Indonesia, Malaysia, Nigeria, Oman, Qatar, Trinidad, and United Arab Emirates. The LNG for the proposed terminal would likely be imported from six plants in the Pacific (located in Brunei, Indonesia, Malaysia, and Australia) and four plants in the Middle East (located in Oman, United Arab Emirates, and Qatar). Although LNG vessels and their operation are directly related to the use of the proposed import terminal, they are not subject to section 3 authorization. LNG vessels are, however, regulated through other methods. A detailed discussion of LNG ship standards and design features is presented below. Additional information on LNG ship regulations and safety measures is presented in section 4.11.7.

Ship Standards and Requirements

The LNG ships arriving at the SES terminal must comply with all federal and international standards regarding LNG shipping. This compliance is demonstrated by the operator of the LNG ship having proper certificates authorizing the transport of LNG as follows:

- United States Flag LNG Ship - The Coast Guard Certificate of Inspection must be valid and endorsed for the ship to transport LNG (Title 46 CFR Part 154, 1979).

- Foreign Flag LNG Ship - The ship must have a valid Certificate of Compliance issued by the Coast Guard. The certificate is issued after the ship has proved that it complies with the Coast Guard regulations and after it has been satisfactorily inspected by a Coast Guard Marine Safety Office (Title 46 CFR Part 154, 1979).

Both United States and foreign flag ships must be annually inspected by the Coast Guard and the flag state. A Coast Guard Certificate of Inspection is required every 2 years. Coast Guard officers may board the LNG ships arriving at the mouth of Queens Gate to ensure safety standards. The specific identity of LNG ships that would unload at the terminal would depend on the commercial terms of the LNG purchase agreements.

Ship Design and Construction

As discussed in section 2.1.1.1, the typical ship size associated with the proposed LNG terminal would be between 125,000 and 165,000 cubic meters. LNG vessels of this size would typically have a total length of between 950 to 1,000 feet, a beam (width) of about 150 feet, and a loaded draft of about 40 feet.

The ships that transport LNG are specially designed and constructed to carry LNG for long distances. As described below, LNG ship construction is highly regulated and consists of a combination of conventional ship design and equipment, with specialized materials and systems designed to safely contain liquids stored at temperatures of -260 °F.

Profile – LNG ships have a distinctive appearance compared to other transport ships. An LNG ship has a high freeboard (i.e., that portion of the ship above water) in comparison with vessels such as an oil tanker because of the comparatively low density of the cargo. Because of the high freeboard, wind velocity can adversely affect the maneuverability of the ship, particularly at slow speed, such as during docking.

Hull System – The International Maritime Organization's (IMO) Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (Gas Tanker Code) and Coast Guard regulations require that LNG ships meet a Type IIG standard of subdivision, damage stability, and cargo tank location. The Type IIG design ensures the LNG ship could withstand flooding of any two adjacent compartments without an adverse effect upon the stability of the ship. The Type IIG design also requires that the cargo tanks must be a minimum of 30 inches from the outer hull and minimum distance above the bottom of the ship equal to the beam of the ship divided by 15, or 6.5 feet, whichever is less. This distance is intended to prevent damage to the cargo tanks in case of low-energy-type accidents that might occur in harbors and during docking. Most large LNG ships have a distance of 10 to 15 feet between the outer hull and cargo tank.

Containment Systems – The LNG containment system on an LNG ship consists principally of the cargo tank (sometimes called a primary barrier), the secondary barrier, and insulation. The containment system also includes cargo monitoring and control and safety systems.

Three basic tank designs have been developed for LNG cargo containment: prismatic free-standing, spherical, and membrane. The earliest form of LNG containment is the prismatic free-standing tank. It consists of an aluminum alloy or 9 percent nickel-steel, self-supporting tank that is supported and restrained by the hull structure. Insulation consists of reinforced polyurethane foam on the bottom and the sides, with fiberglass on the top. The spherical tank design uses an unstiffened, spherical, aluminum alloy tank that is supported at its equator by a vertical cylindrical skirt, with the bottom of the skirt integrally welded to the ship's structure. This free-standing tank is insulated with multi-layer close-cell polyurethane panels.

In the membrane containment system, the ship's hull constitutes the outer tank wall, with an inner tank membrane separated by insulation. Two forms of membrane are commonly used: the Technigaz membrane using stainless steel and the Gas-Transport membrane using Invar.

LNG tankers are of the double-hull design regardless of the containment system used. A double bottom and double sides are provided for the full length of the cargo area and arranged as ballast tanks, independent of the cargo tanks. The double-hulled design provides greatly increased reliability of cargo containment in the event of grounding and collisions. Further, the segregated ballast tanks prevent ballast water from mixing with any residue in the cargo tanks.

Pressure/Temperature Control – A basic goal of all LNG containment systems is to maintain the LNG cargo at or near atmospheric pressure at the boiling temperature of the LNG (about -260 °F). This is accomplished using "auto-refrigeration," a phenomenon that results from the constant heat flow into the tank and the removal of the associated vapor.

The vapor generated during auto-refrigeration is known as boil-off gas. Typical boil-off gas rates of LNG ships range from 0.15 to 0.25 percent (by volume) per day. Currently, all LNG ships burn the boil-off gas as fuel. Because the Coast Guard does not permit routine venting of boil-off gas to the atmosphere in the United States, all LNG ships that trade in the United States are fitted with an internalized combustion energy system that allows the ship's boilers to consume all of the boil-off gas to fuel the ship's steam propulsion system. As a result, LNG ships have reduced emissions compared to conventional oil-fired ships.

Propulsion Systems – Almost all of the currently operational large LNG ships are steam turbine driven. Steam ships use a boiler that is fired from the ship's natural gas cargo (the boil-off gas referred to above). The boiler can also be fired with heavy fuel oil or in any ratio with natural gas. At sea, the ship normally uses natural gas plus a small quantity of fuel oil (approximately 2 tons per day) for a pilot flame.

As a ship approaches port, the use of fuel oil may increase to about 10 tons per day. The increase occurs because the natural gas fuel supply system is complicated with greater risk of shutdown. Therefore, the additional fuel oil is used for safety to ensure adequate steam supply for propulsion.

Both underway and in port, the power on a steam ship is provided by separate steam turbine-driven generators. There may also be a diesel generator that would be used for emergencies.

At the berth, the main boilers are generally kept running to provide power to the cargo pumps. During cargo unloading, the cargo pumps and ship auxiliary equipment require 5 to 10 megawatts (MW) of power. Part of the fuel used to provide power is LNG; the rest is fuel oil. LNG ships are not currently equipped to receive shoreside power for use during cargo unloading. Generally some LNG is left onboard for the return voyage fuel and for keeping the cargo tanks cold.

Several large diesel electric-powered LNG ships are currently under construction. These ships have four or more diesel-driven electric generators that provide both propulsion and electric power. Ship propulsion is with two electric motors directly connected to the propeller shaft.

The switch to diesel is being driven by several factors. The first is fuel consumption. The overall thermal efficiency of a steam propulsion system is about 28 percent while diesel power is over 40 percent efficient. This increased efficiency would result in large fuel savings, particularly for the new longer distance trade routes. Because of the rarity of steam systems outside of LNG ships, it has become difficult for the ship operators to obtain adequately trained personnel. In addition, locations with steam maintenance capabilities are becoming fewer.

Two approaches are being used for diesel electric-powered LNG ships. One is to use engines that will consume boil-off natural gas with partial heavy fuel oil pilot injection. Under full load, the engine uses 10 to 15 percent oil with the balance being natural gas. At lower power levels, these engines consume a higher portion of fuel oil. At idle they may require 100 percent fuel oil and no natural gas.

The second diesel electric-powered approach uses all heavy fuel oil and no natural gas. On these ships, a system will be installed to reliquefy the boil-off gas and return it to the ship's cargo tanks. Some of these ships may be equipped with secondary low sulfur fuel tanks for port operation.

Ballast Tanks – Sufficient ballast water capacity must be provided to permit the ship to return to the loading port safely under various sea conditions. LNG cargo tanks are not used as ballast tanks because these tanks must contain a minimal amount of LNG in them at all times, even when "empty" in order to keep the tanks cold during normal operation. Consequently, LNG ships must be designed to provide adequate ballast capacity in other locations.

Ballast water tanks of the LNG ships are arranged within the LNG ship's double hull. It is essential that ballast water not leak into the LNG containment system. To reduce the potential for leakage, the ballast tanks, cofferdams, and the walls of the void spaces are typically coated to reduce corrosion. LNG ships are also periodically inspected to examine the coating and to renew it as necessary.

A ballast control system, which permits the simultaneous ballasting during cargo transfer operations, is also incorporated into each LNG ship. This allows the LNG ship to maintain a constant draft during all phases of its operation to enhance performance.

Ship Safety Systems

Ships that transport LNG to the proposed terminal would be fitted with an array of cargo monitoring and control systems. These systems would automatically monitor key cargo parameters while the ship is at sea and during the remote-control phase of cargo operations at the unloading terminal.

The system includes provisions for pressure monitoring and control, temperature monitoring of the cargo tanks and surrounding ballast tanks, emergency shutdown of cargo pumps and closing of critical valves, monitoring of tank cargo levels, and gas and fire detection.

LNG ships are fitted with many navigation and communication systems, including:

- two separate marine radar systems, including automatic radar plotting and radio direction finders;
- LORAN-C receivers;
- echo depth finders; and
- a satellite navigation system.

All LNG ships also have redundant, independent steering control systems that are operable from the bridge or steering gear room to maintain rudder movement in case of a steering system failure. In addition, all LNG ships must have an Automatic Identification System that displays the vessel's identity, location, course, and speed to the Coast Guard and other vessels for collision avoidance and maritime security.

Fire Protection

All LNG ships arriving at the proposed terminal would be constructed according to structural fire protection standards contained in the International Convention for Safety of Life at Sea (SOLAS). This would be done under the review and approval procedures of the Coast Guard.

LNG ships using the terminal would also be fitted with active fire protection systems that meet or exceed design parameters in Coast Guard regulations and international standards, such as the Gas Tanker Code and SOLAS, including:

- a water spray (deluge) system that covers the accommodation house and control room and all main cargo control valves;
- a traditional firewater system that provides water to fire monitors on deck and to fire stations found throughout the ship;
- a dry chemical fire extinguishing system for hydrocarbon fires; and
- a CO_2 system for protecting the machinery, the ballast pump room, emergency generators, compressors, etc.

Crew Qualifications and Training

All officers and crews of the LNG ships are required to comply with the International Convention Standards of Training, Certification, and Watch Keeping for Seafarers. Key members of the crew must have specific training in the handling of LNG and the use of safety equipment. Officers must receive simulator training in the handling of the ship and the cargo systems specific to the conditions at the project site.

2.1.3 Natural Gas and C_2 Pipelines and Associated Aboveground Facilities

A 2.3-mile-long, 36-inch-diameter pipeline would be constructed to transport natural gas from the LNG terminal to the existing local distribution system. Associated aboveground facilities include a meter station, odorization system, and pig launcher and receiver. These facilities would be constructed, owned, and operated by SES. The meter station would provide custody transfer of the sendout gas. The odorization system is designed for proportional-to-flow odorant (e.g., methyl mercaptan) injection, odorization measurement, system monitoring, and alarm notification. The locations of these facilities are shown on figure 2.1-1.

A 4.6-mile-long, 10-inch-diameter pipeline would be constructed to transport vaporized C_2 from the LNG terminal to the existing LARC. Associated facilities include a meter station and a pig launcher and receiver. The meter station would provide custody transfer of the C_2. These facilities would be constructed, owned, and operated by ConocoPhillips. The locations of these facilities are shown on figure 2.1-1.

As shown on figure 2.1-1, the first 2.3 miles of the C_2 pipeline would be installed adjacent to the proposed natural gas pipeline. Both pipelines would run north from the terminal along Carrack Avenue and beneath the Cerritos Channel to the intersection with Pier A Way. The pipelines would then turn west along Pier A Way to the Los Angeles/Long Beach city boundary and then north along Carrack Avenue to the SoCal Gas pipeline system (Salt Works Station) north of Anaheim Street.

The C_2 pipeline would continue west to Foote Street where it would turn north for about 0.6 mile before turning west to join the east side of the Dominguez Channel. It would continue north along the east side of the Dominguez Channel and then turn west and be installed across the Dominguez Channel on an existing pipe bridge. It would then continue west to Alameda Street where it would turn north for about 0.2 mile before crossing Alameda Street and entering the LARC.

2.1.4 Electric Distribution Facilities

SCE would install 0.8 mile of electric distribution lines to provide 66 kV service to a new substation (the Sound Substation) that would be located within the terminal boundaries at the northern end of the site. The new substation would provide a dedicated and redundant service for the Long Beach LNG Import Project. The locations of the proposed electric distribution lines are shown on figure 2.1-1. The location of the new substation is shown on figures 2.1-1 and 2.1.1-1.

2.2 LAND REQUIREMENTS

Table 2.2-1 summarizes the land requirements for the facilities associated with the Long Beach LNG Import Project. A detailed discussion of land requirements is presented in section 4.5.2.

TABLE 2.2-1

Summary of Land Requirements Associated with the Long Beach LNG Import Project

Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
LNG Terminal Facilities		
LNG Terminal Site	25.0	25.0
Ship Berth and Unloading Facility [a]	5.3	0.5
Reinforcement of the Shoreline Structures [b]	6.6	6.6
Temporary Laydown and Worker Parking Area	16.0	0.0
Temporary Barges	4.0	0.0
LNG Terminal Facilities Subtotal	56.9	32.1
Natural Gas and C_2 Pipelines and Associated Aboveground Facilities		
Natural Gas Pipeline Facilities		
Pipeline Right-of-Way [c]	9.5	1.1
Temporary Extra Workspace	1.1	0.0
Aboveground Facilities	0.3	0.3
Natural Gas Pipeline Facilities Subtotal	10.9	1.4
C_2 Pipeline Facilities [d]		
Pipeline Right-of-Way [c]	17.8	2.2
Temporary Extra Workspace	1.1	0.0
Aboveground Facilities	0.3	0.3
C_2 Pipeline Facilities Subtotal	19.2	2.5
Natural Gas and C_2 Pipelines and Associated Aboveground Facilities Subtotal	30.1	3.9
Electric Distribution Facilities	1.0	1.0
Project Total	88.0	37.0

a Includes impacts on the sea floor of the West Basin associated with dredging and operation of the ship berth and unloading facility.
b Includes impacts on the sea floor of the West Basin associated with dredging to reinforce the shoreline structures.
c Based on a 30- to 50-foot-wide construction right-of-way. Operation acreage is based on a 4-foot-wide permanent right-of-way in all areas.
d The first 2.3 miles of the C_2 pipeline would follow the same route as the proposed natural gas pipeline; however, the two pipelines would be constructed at different times. Therefore, the acreage presented includes the entire 4.6 miles of the C_2 pipeline.

2.2.1 LNG Terminal Facilities

The entire 25-acre previously developed site would be used for construction and operation of the LNG terminal facilities. In addition to the 25-acre site on land, a 200-foot-wide by 1,150-foot-long area would be dredged for the ship berth and unloading facility adjacent to Pier T. These dredging activities would result in about 5.3 acres of disturbance to the sea floor within the West Basin. Of these 5.3 acres, the ship berth and unloading facility would permanently occupy about 0.5 acre. Two additional areas along the western and southern edges of Pier T would be dredged to reinforce the shoreline structures. These areas would be 150 feet wide by 250 feet long and 180 feet wide by 1,400 feet long for a total disturbance to the sea floor of 6.6 acres during both construction and operation. However, no new land would be created.

A 16-acre gravel-covered site located on Pier T about 1 mile northwest of the LNG terminal would be used for temporary construction laydown, staging, storage, and worker parking (see figure 2.1-1). In addition to the temporary laydown area on land, construction materials would be shipped by barge to the LNG terminal site. An estimated four to six barges would be moored around the LNG terminal site at various times during construction of the LNG storage tanks. These barges would provide about 4.0 acres of additional temporary extra workspace.

2.2.2 Natural Gas and C_2 Pipelines and Associated Aboveground Facilities

Construction of the pipeline facilities would disturb a total of about 30.1 acres of land, including the pipeline construction rights-of-way, temporary extra workspace, and aboveground facilities. Of the 30.1 acres of land affected by construction of the pipeline facilities, about 1.4 acres would be retained for operation of the natural gas pipeline facilities and 2.5 acres would be retained for operation of the C_2 pipeline facilities.

A 30- to 50-foot-wide construction right-of-way would be used for each of the pipelines. Following construction, a 4-foot-wide permanent right-of-way would be retained for operation and maintenance of the pipelines. The right-of-way configurations for the natural gas and C_2 pipelines are shown on figures 2.2.2-1 and 2.2.2-2, respectively. In general, the pipelines would be located adjacent to or within existing utility or road rights-of-way.

For the portion of the pipelines on private land, SES and/or ConocoPhillips would need to acquire an easement or property to construct and operate the proposed facilities. The easement would convey both temporary (for construction) and permanent rights-of-way and give the right to construct, operate, and maintain the pipeline facilities. An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way after construction.

The meter station, odorization system, and pig launcher associated with the natural gas pipeline would be located on a 150-foot by 150-foot site located within the LNG terminal facility site. The pig receiver would be constructed on a 75-foot by 150-foot site in an industrial area at the end of the pipeline where it interconnects with the SoCal Gas system.

The meter station and pig launcher for the C_2 pipeline would be located adjacent to the meter station and pig launcher associated with the natural gas pipeline within the 150-foot by 150-foot site at the LNG terminal facility. The pig receiver would be constructed on a 100-foot by 150-foot fenced site within the LARC.

2.2.3 Electric Distribution Facilities

Construction and operation of the electric distribution facilities would affect about 1.0 acre of industrial land.

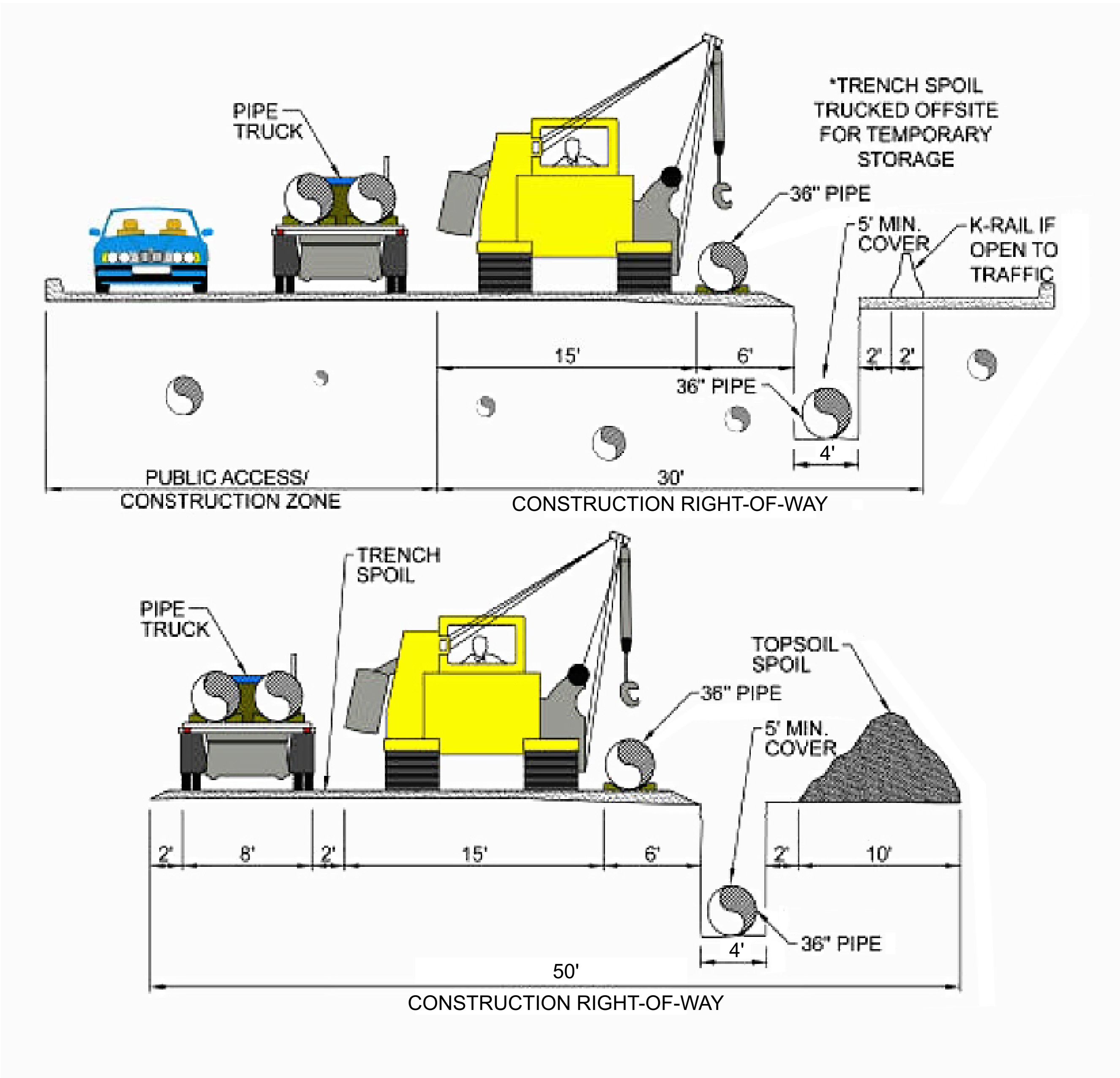


Figure 2.2.2-1

Long Beach LNG Import Project

Typical Construction Right-of-Way Configurations for the Natural Gas Pipeline

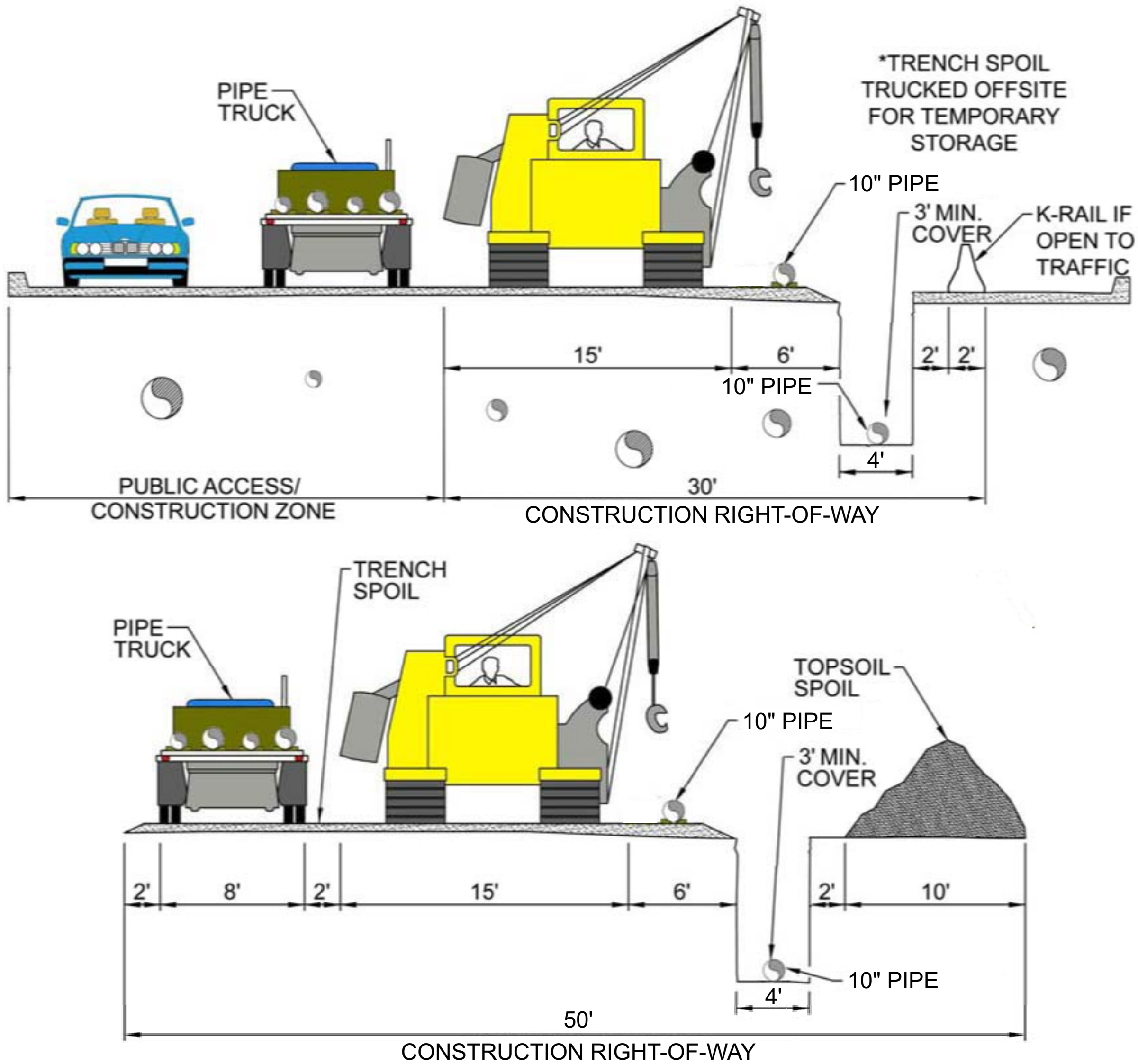


Figure 2.2.2-2

Long Beach LNG Import Project

Typical Construction Right-of-Way Configurations for the C_2 Pipeline

2.3 CONSTRUCTION PROCEDURES

This section describes the general procedures that would be used for construction of the LNG terminal, the natural gas and C_2 pipelines and associated aboveground facilities, and the electric distribution facilities. Refer to section 4.0 for more detailed discussions of proposed construction and restoration procedures as well as additional measures recommended by the Agency Staffs to mitigate environmental impacts.

The proposed LNG terminal facilities would be designed, constructed, operated, and maintained in accordance with federal safety standards that are intended to ensure adequate protection for the public and to prevent LNG accidents or failures. Specifically, these are the DOT *Federal Safety Standards for Liquefied Natural Gas Facilities*, Title 49 CFR Part 193 and the *National Fire Protection Association Standards for the Production, Storage, and Handling of LNG* (NFPA 59A). These standards specify siting, design, construction, equipment, and fire protection requirements for new LNG facilities. The ship unloading facility and any appurtenances located between the LNG ships and the last valve immediately before each LNG storage tank would comply with applicable sections of the Coast Guard regulations for *Waterfront Facilities Handling LNG* (Title 33 CFR Part 127 and Executive Order 10173).

The proposed natural gas and C_2 pipeline facilities would be designed, constructed, operated, and maintained in accordance with DOT regulations in Title 49 CFR Part 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*. Among other design standards, Title 49 CFR Part 192 specifies pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel.

Construction activities would comply with all permit conditions and the requirements and Best Management Practices (BMPs) included in SES' Storm Water Pollution Prevention Plan (SWPPP) prepared in accordance with the California State Water Resources Control Board's (CSWRCB) National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activity. SES' SWPPP includes a Sediment Control Plan that incorporates the measures of the FERC staff's Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures (January 17, 2003 versions) that are relevant to the environmental conditions at the project site. The SWPPP also incorporates a Spill Prevention and Response Procedure (Spill Procedure) that addresses potential spills of fuels, lubricants, and other hazardous materials and describes spill prevention practices, spill handling and emergency notification procedures, and training requirements. SES' SWPPP, Spill Procedure, and Sediment Control Plan are discussed in more detail in sections 4.3.3.2, 4.3.2.2, and 4.2.2.2, respectively. A draft of the SWPPP is provided in Appendix B**.**

In addition, SES has prepared a Horizontal Directional Drill Plan (HDD Plan) for the crossings of the Cerritos Channel that identifies specific procedures and steps involved with pipeline installation as well as corrective actions and cleanup procedures in the event of an inadvertent release of drilling fluid. The HDD Plan is discussed in more detail in section 4.3.3.2 and provided in Appendix C.

Activities conducted by the POLB would comply with the requirements and BMPs in the POLB's SWPPP and all permit conditions, including the Dredge and Disposal Plan the POLB would prepare in accordance with its ACOE section 404 permit (see section 4.3.3.2). As discussed in section 2.1.1.1, the dredging activities would be done only with the concurrence of the DTSC.

2.3.1 LNG Terminal Facilities

2.3.1.1 LNG Storage and Processing Facilities

Site Preparation and Materials and Equipment Delivery

The site plot plan (figure 2.1.1-1) shows the location of the terminal facilities, which include site offices, office parking, construction gates, crew change and toilet facilities, tool trailers, and ready-to-use material laydown areas. An approximate 16-acre laydown area on Ocean Boulevard would also be used for temporary storage of construction materials and equipment (see figure 2.1-1). The construction workforce would park in this 16-acre area and be transported to the site via buses.

Materials and equipment would be shipped from the place of origin to the POLB by road, rail, or barge either to the terminal site or to the temporary laydown area on Ocean Boulevard. Unloading would be conducted either by crane or roll-on/roll-off. Local fabrication shops would be used to fabricate pipe spool pieces and other prefabricated units of equipment and skid-mounted process equipment modules with delivery to the site in accordance with the construction schedule. Where possible, skid-mounted equipment would be utilized to minimize the pieces that must be erected at the site.

The first step in the construction of the LNG storage tanks and processing facilities would be site preparation, including demolition and removal of existing buildings and pavement. The buildings and structures associated with the former Long Beach Naval Shipyard would be demolished, removed, and disposed of at an approved landfill by the POLB. In addition, the existing concrete/asphalt surface would be removed.

Excavation, Ground Stabilization, and Foundation Installation

Following POLB demolition and removal of the existing structures, approximately 1 foot or 40,000 cubic yards of soil would be stripped from the site by SES. Where necessary, soft areas would be over-excavated and filled with structural fill. Temporary drainage ditches, sediment fences, and silt traps would be installed as necessary to prevent erosion.

The next step would be construction of foundations for the storage tanks, process equipment, and pipe racks. Because the site soils are generally unsuitable for direct support of the proposed LNG storage tanks, the foundations would be supported by steel piles that would be driven to depths of approximately 90 to 120 feet. A reinforced concrete base slab foundation would be constructed on the piles on which the LNG storage tanks would be built with seismic isolators or a flexible foundation to reduce horizontal seismic load (see figure 2.1.1-3). Additional details of the foundation soil improvements are presented in section 4.1.4.3. The installation of the seismic isolators, settlement monitoring system, foundation heating conduit, and sensing conduit along with upper and lower layers of reinforcing steel would be included with construction of the concrete slab for the storage tanks. The top of the concrete foundations for all critical equipment and structures would be installed at an elevation of 20 feet above mean sea level (msl). Following completion of the foundations, the site would be filled, compacted, and brought up to final grade.

In addition to the soil improvements described above to support the tank foundations, other ground stabilization measures would be necessary to support the upland loads generated by the LNG storage tanks and other heavy structures. These stabilization measures would consist of stone columns installed in the area between the back of the existing concrete Berth T-126 wharf and north of the Berth T-124 structure to the face of the LNG storage tanks. Columns would likely be on 8-foot centers along the entire length of Berth T-126 and along approximately 560 feet of Berth T-124. Approximately 2,400 stone columns would be drilled behind Berth T-126 to a depth of 60 feet, an estimated 980 columns would be drilled behind Berth T-124 to a depth of approximately 80 feet, and an estimated 2,000 stone columns would be drilled within the security barrier wall to a depth of 60 feet. The stone columns would be formed by using a vibratory or rotary probe to penetrate to the design depth and then filling the resulting cavity with stone. The stone would be forced through the probe starting at the bottom and compacted as the probe is raised toward the surface. Responsibility for the installation of the stone columns has not been established. The work could be done by SES or the POLB in conjunction with other work such as the tank foundation soil improvements described above, construction of the concrete security barrier wall described in section 2.1.1.2, or the reinforcement of the shoreline structures described in section 2.3.1.2.

The storm water drainage system would be installed so that surface water and spills would drain to designated areas for safe containment and disposal. Storm water runoff collected in the spill containment systems would be pumped to nearby culverts, swales, and ditches that discharge through the existing storm water outfall located at the northwest corner of the terminal site.

Storage Tank Construction

One of the more labor-intensive and time-consuming activities would be the construction of the full containment storage tanks. Storage tank construction would take approximately 37 months of the 48-month construction period and would begin approximately 11 months after the initiation of construction. Details of the construction workforce are discussed in section 4.6.3. After the foundations of the tanks are installed as discussed above, the tank construction would consist of the following activities:

- construction of the 9 percent nickel-steel inner containers;
- construction of the outer concrete container walls;
- installation of the steel dome roofs and suspended decks;
- installation of internal tank accessories, roof platforms, walkways, and piping;
- construction of the concrete roof;
- hydrostatic testing of the inner tanks and pneumatic testing of the outer tanks (see discussion below); and
- installation of fiberglass blankets and perlite insulation between the inner and outer tanks.

The inner containers of the storage tanks would be hydrostatically tested in accordance with API 620 to ensure that the tanks are capable of operating at the design pressure. Approximately 24 million gallons of water obtained from the City of Long Beach municipal system would be used to test the tanks. Water would be pumped into each tank at rates not exceeding the limitation set by API 620 and piped into the inner container through the manhole in the outer container concrete roof. The water would remain in each tank for approximately 7 weeks from start of filling to completion of discharge. The water would be transferred between each tank and ultimately discharged using the POLB storm water drainage system upon completion of the test(s). The discharge would be regulated over a period of approximately 40 hours to not exceed the capacity of the system.

The pneumatic test of the LNG storage tank outer container would be performed in accordance with API 620. The outer container would be held at 1.25 times the design pressure for 1 hour.

Other Facility Construction

During the construction of the storage tanks, other facility structures and buildings would be constructed and major mechanical and electrical equipment, process and utility piping, and instrumentation would be installed. All of these facilities would be completed and precommissioned in readiness for completion of the storage tanks.

Final Grading and Site Restoration

Areas disturbed by construction of the LNG terminal facilities would be stabilized with temporary erosion controls until construction is complete unless covered by equipment, gravel, or other covering. Following construction, the site would be final graded; cleaned up; and surfaced with gravel, asphalt, and concrete.

2.3.1.2 Reinforcement of the Shoreline Structures

The existing shoreline structures consist of a rock dike with a pile-supported concrete wharf along the west side of the site (Berth T-126) and a bulkhead composed of a cellular steel sheet pile cofferdam system with a continuous concrete beam on steel and timber pile forming the pierhead along the south side of the site (Berth T-124). These structures would need to be reinforced to support the upland loads generated by the LNG storage tanks and other heavy load structures. The geotechnical and structural analysis of the shoreline structures and the necessary reinforcement work would be the responsibility of the POLB.

The POLB is evaluating three different options for reinforcement of the wharf along Berth T-126. These include:

- repairing, maintaining, and seismically upgrading the existing wharf structure. The seismic upgrade would include strengthening the lateral load-resisting system (which would include driving additional piling), retrofitting the pile capitals, and stabilizing the existing rock slope with an underwater rock buttress;

- demolishing the existing wharf deck (leaving the embedded concrete pile in place) and constructing an underwater and above water rock buttress large enough to accommodate access to the LNG unloading platform and the perimeter road; or

- demolishing the westerly portion of the existing wharf (i.e., cutting the structure's width by approximately half) to reduce the seismic mass. This would be done in conjunction with the repair, maintenance, and seismic upgrade of the remaining structure. The existing rock slope would also be stabilized with an underwater rock buttress.

The underwater rock buttress at Berth T-126 would be approximately 180 feet wide at the base and extend the full length of the 1,400-foot-long berth. Depending on the final wharf improvement option selected, construction of the Berth T-126 rock buttress would require between 900,000 to 1.2 million tons of rock. An underwater rock buttress would also be necessary along the westerly portion of Berth T-124. This rock buttress would be approximately 150 feet wide and 250 feet long and would require between 100,000 and 500,000 tons of rock. No additional structural improvements would be necessary at Berth T-124. Installation of the rock buttresses at Berth T-126 and Berth T-124 would require the dredging of between 100,000 and 300,000 cubic yards of sediments depending on the west wharf improvement and rock buttress configuration option chosen.

Demolition activities would require a combination of water- and land-based equipment including barges, tugboats, workboats, bulldozers, other track crawler-mounted equipment, and trucks for hauling concrete debris and miscellaneous small equipment. Processing of concrete and steel debris would take place upland and the crushed concrete used as base material either on site or elsewhere at the Port. Steel reinforcing bar would be recycled.

Wharf rehabilitation including driving replacement piles would be accomplished from both water- and land-based equipment including a pile driver (crane), workboats, trucks, and miscellaneous small equipment.

The reinforcement of the shoreline structures and associated dredging would be under the jurisdiction of the ACOE and would require separate permits.

2.3.1.3 Construction of the Ship Berth and Unloading Facility

As stated in section 2.1.1.1, the current water depth at Pier T-126 ranges from -46 feet to -53 feet MLLW. Preparation of the berth would require the dredging of approximately 175,000 cubic yards of sediments to a depth of about -55 feet MLLW to accommodate safe under keel clearance and tidal fluctuation. This depth would accommodate the largest LNG ships expected to use the terminal. As part of the POLB's consent agreement with the DTSC regarding the sediment remediation in the West Basin, the dredging associated with the proposed project would be done only with the concurrence of the DTSC and in accordance with separate permits issued by the ACOE and the RWQCB (see section 4.2.3). The dredged area would be about 200 feet wide by 1,150 feet long. The POLB would conduct the dredging and dispose of the dredged material at an approved site within the Port.

The ship unloading facility would likely be constructed using floating equipment. Several options are available for the construction of the unloading platform and mooring and breasting dolphins. The unloading platform could be constructed of a cast-in-place concrete deck supported by a combination of steel and concrete plumb and batter piles. The piles would be driven in the proper location to the appropriate depth, concrete pile caps cast, and the cast-in-place platform slab placed. An alternative method for the construction of the unloading platform would be to use an offshore technique. A jacket would be prefabricated at an offsite location and transported to the site on a barge. The jacket would be placed at the proper location with the use of ballast tanks and cranes mounted on a work barge. Piles would then be driven through the legs of the jacket to secure the platform.

The construction of the dolphins could be completed in several ways including driving large diameter steel pipe plumb, or a combination of steel and concrete plumb and batter piles, then casting a concrete cap. An alternative method would be to use jacketed structures for the dolphins. The jackets would be fabricated offsite and transported for installation at the site. Piles would be driven through the legs. The dolphins would be fitted with quick release hooks and a fendering system. Due to the weight of the pipe piles and the weight of the hammer to drive the piles, large floating equipment would be necessary.

2.3.2 Natural Gas and C_2 Pipelines and Associated Aboveground Facilities

The entire route of the natural gas and C_2 pipelines is within heavily disturbed, industrialized areas. No wetlands or residential areas would be crossed. One waterbody (the Cerritos Channel) and several railroad lines, driveways, and roads would be crossed by both pipelines. The C_2 pipeline would also cross the Dominguez Channel.

Standard pipeline construction proceeds in the manner of an outdoor assembly line composed of specific activities that make up the linear construction sequence. In an industrial area, these operations collectively include survey and marking of the right-of-way, potholing to locate existing substructures or utilities; sawing an outline of the trench in paved areas so that pavement can be broken and removed; trenching, pipe stringing, and bending; welding, x-ray inspection of welds, weld coating, and testing; lowering-in and backfilling; hydrostatic testing; and cleanup and replacement of paving. The natural gas and C_2 pipelines would be installed as separate activities because they would be constructed using different pipeline construction spreads. The natural gas pipeline would require much larger equipment and workspace than the C_2 pipeline and there are few areas with open utility slots that would allow both lines to be installed simultaneously in the same trench. Where the pipelines are adjacent to each other (i.e., the first 2.3 miles), the C_2 pipeline would be installed either before or after installation of the natural gas pipeline where the work areas do not interfere with each other or create unmanageable traffic patterns. During pipeline construction along Carrack Avenue, it may be necessary to temporarily close the road. SES would develop traffic control plans and drawings in conjunction with the construction permitting with the POLB, POLA, City of Long Beach, and City of Los Angeles. The northernmost 2.3 miles of the C_2 pipeline would be installed on a separate schedule. The specific construction methods that would be used to install the pipelines consist of the open-cut, stovepipe, slick bore, and HDD methods as described below.

Along much of the route, the pipelines would be installed using the open-cut method. This method consists of excavating a trench of sufficient depth to provide a minimum depth of cover of 30 inches. However, in many places the pipelines would pass under existing utilities, which would provide a greater depth of cover. The pipe sections would be welded together using approved welding procedures and the welds would be inspected to ensure their structural integrity. The pipeline would then be lowered into the trench and the trench would be backfilled with a granular fill or slurry composed of earth removed from the trench or with other fill material hauled to the site.

In some areas of the route where workspace is particularly limited, the stovepipe construction method would be used. This technique would involve excavating limited segments of open trench to the appropriate depth and installing the pipeline a pipe section at a time. The welding and weld inspection would be conducted in the trench. The trench would be backfilled at the end of each day after the welding and coating processes are completed. If any open trench remains at the end of the work day, it would be covered with steel plates.

The slick bore construction method would be used at the railroad and certain driveway and road crossings along the route. This method involves excavating bore pits on each side of the road or crossing at the depth of the pipeline and boring a hole equal to the diameter of the pipeline. The pipe section would then be pushed through the bore hole.

The HDD construction method would be used to install the pipelines beneath the Cerritos Channel. This technique involves drilling a hole from one side of the channel to the other side. Throughout the drilling process, a slurry made of naturally occurring non-toxic materials, such as bentonite clay and water, would be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and hold the hole open. This slurry is referred to as drilling mud or drilling fluid. Drilling mud and any groundwater and soil produced during construction would be handled and disposed of in accordance with federal and state regulations so as to minimize the chance of soil and water pollution. Pipe sections long enough to span the entire crossing would be staged and welded along the construction right-of-way on the opposite side of the channel and then pulled through the drilled hole. The natural gas and C_2 pipelines would be installed as two separate HDDs. Because the natural gas and C_2 pipelines would not be constructed concurrently, no additional HDD staging areas would be needed. Additional discussion of the HDD crossing of the Cerritos Channel is presented in section 4.3.3.2.

The C_2 pipeline would be installed across the Dominguez Channel on an existing pipe bridge that has sufficient capacity to accommodate the pipeline.

The HDD crossings of the Cerritos Channel and the crossing of the Dominguez Channel would be under the jurisdiction of the ACOE and would require separate permits.

Hydrostatic Testing

After burial, each pipeline would be tested to ensure the system is capable of withstanding the operating pressure for which it was designed. This procedure is called hydrostatic testing and is completed using pressurized water in the pipeline. If leaks are found, the leaks would be repaired and the section of pipe retested until specifications are met. Following testing, the water would be discharged into the POLB storm water drainage system. The test water would be sampled before use and before discharge. Additional discussion of hydrostatic testing is presented in sections 4.3.2.2 and 4.3.3.2.

Cleanup and Restoration

Once pipeline construction activities are complete in a given section, the grade and drainage patterns would be reestablished. Permanent erosion controls would be installed to minimize post-construction erosion in dirt areas, and pavement would be reinstalled in paved areas.

2.3.3 Electric Distribution Facilities

The entire route of the electric distribution lines is within heavily disturbed, industrialized areas of the POLB. A total of 10 new steel poles would be required to support the new conductors. A backhoe would be used to excavate a hole large enough for placement of a casing to form the concrete foundations. A mobile crane would be used to set the new steel pole structures in place. After the new structures are erected, the new conductors would be strung using standard stringing equipment such as roller and puller assemblies.

2.4 CONSTRUCTION SCHEDULE

No work would begin until all required permits and approvals are in place. Assuming the project is approved, once SES begins construction of the LNG terminal facilities, it would take approximately 48 months to complete. The POLB would begin the reinforcement of the shoreline structures and conduct the dredging concurrently with SES' initiation of activities. The wharf improvements would take about 6 to 8 months; dredging and placement of the rock buttresses would take 8 to 10 months. Construction of the ship unloading facility would require about 10 to 12 months. Storage tank construction would take approximately 37 months and would begin approximately 11 months after the initiation of construction. Construction of the pipelines and electric distribution facilities would take approximately 10 months to complete and would occur toward the middle of the 48-month construction period.

2.5 ENVIRONMENTAL COMPLIANCE INSPECTION AND MITIGATION MONITORING

As the lead federal agency for the project, the FERC may impose conditions on any authorization granted for the project. These conditions could include additional requirements and mitigation measures identified in the EIS/EIR to minimize the environmental impact that would result from the construction of the project (see sections 4.0 and 6.0). The FERC staff will recommend to its Commission that these additional requirements and mitigation measures (offset with bold type in the text) be included as specific conditions to any approval issued for the project. If it approves the project, the FERC will require SES to implement the construction procedures and control measures that it has proposed as part of the project unless specifically modified by other conditions of the authorization.

The ACOE, as lead agency for compliance with section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act, may similarly impose conditions to mitigate or prevent impacts on aquatic resources due to construction of the project.

As the California state lead agency, the POLB would adopt a mitigation monitoring program for the project pursuant to the CEQA. While there would be some jurisdictional differences between the FERC's and the POLB's requirements, the mitigation monitoring program for the Long Beach LNG Import Project would include requirements placed on the project by the FERC, the POLB, and other agencies. The FERC and the POLB would monitor compliance with project control and mitigation measures and requirements through FERC and POLB staffs or by use of a third-party compliance monitor. The POLB would also be responsible for mitigation resulting from potential ACOE permit decisions, dependent on the potential impacts of the final design on waters of the United States. Other federal and state agencies would conduct oversight of inspection and monitoring to the extent determined necessary by the individual agency.

SES would assign an Environmental Inspector (EI) to the project who would be responsible for all environmental compliance activities at the construction site. The responsibilities of the EI are outlined in section IV.C. and Appendix H of SES' draft SWPPP (see Appendix B) and would include ensuring that the environmental conditions attached to the FERC's section 3 authorization, the POLB's Harbor Development Permit, the ACOE's section 404 and section 10 permits, and other permits and authorizations are met. The EI would have peer status with all other activity inspectors and would have the authority to stop activities that violate the conditions of the project's permits and authorizations.

2.6 OPERATION AND MAINTENANCE PROCEDURES

SES would operate and maintain the LNG terminal facilities in compliance with NFPA 59A, Title 49 CFR Part 193, Title 33 CFR Part 127, and other applicable federal and state regulations. In accordance with Title 49 CFR Parts 193.2503 and 193.2605 and sections 11.3.1 and 11.5.2 of NFPA 59A, SES would prepare and submit to the DOT for approval before construction, operation and maintenance manuals that address specific procedures for the safe operation and maintenance of the LNG storage and processing facilities. These manuals would address startup, shutdown, cooldown, purging, and other routine operation, maintenance, and monitoring procedures. In accordance with Title 33 CFR Part 127.305, SES would also prepare an operation manual that addresses specific procedures for the safe operation of the ship unloading facility. These manuals would include training requirements and programs for operations and maintenance personnel.

The natural gas and C_2 pipeline facilities would be operated and maintained in accordance with Title 49 CFR Part 192, *Minimum Federal Safety Standards for the Transportation of Natural and Other Gas by Pipeline*, as required by the DOT. Section 4.11.12 presents a discussion of the DOT's safety regulations and requirements for natural gas pipelines and describes how these requirements would be met by the pipeline operator.

The electric distribution facilities would be operated and maintained in accordance with federal and state regulations and the operations plan of SCE.

2.7 SAFETY CONTROLS

2.7.1 LNG Terminal Facilities

The LNG terminal facilities would be sited, designed, constructed, operated, and maintained in compliance with federal safety standards. Federal siting and design requirements for LNG facilities are summarized in table 2.7.1-1.

TABLE 2.7.1-1

Federal Siting and Design Requirements for LNG Facilities

Requirement	Description
Thermal Radiation Protection (Title 49 CFR Part 193.2057 and section 2.2.3.2 of NFPA 59A)	This requirement is designed to ensure that certain public land uses and structures outside the LNG facility boundaries are protected in the event of an LNG fire.
Flammable Vapor-Gas Dispersion Protection (Title 49 CFR Part 193.2059 and sections 2.2.3.3 and 2.2.3.4 of NFPA 59A)	This requirement is designed to prevent a flammable vapor cloud associated with an LNG spill from reaching a property line that can be built upon.
Wind Forces (Title 49 CFR Part 193.2067)	This requirement specifies that all facilities be designed to withstand wind forces of not less than 150 mph without the loss of structural integrity.
Impounded Liquid (section 2.2.3.8 of NFPA 59A)	This requirement specifies that liquids in spill impoundment basins cannot be closer than 50 feet from a property line that can be built upon or a navigable waterway.
Container Spacing (section 2.2.4.1 of NFPA 59A)	This requirement specifies that LNG containers with capacities greater than 70,000 gallons must be located a minimum distance of 0.7 times the container diameter from the property line or buildings.
Vaporizer Spacing (section 2.2.5.2 of NFPA 59A)	This requirement specifies that integral heated vaporizers must be located at least 100 feet from a property line that can be built upon and at least 50 feet from other select structures and equipment.
Process Equipment Spacing (section 2.2.6.1 of NFPA 59A)	This requirement specifies that process equipment containing LNG or flammable gases must be located at least 50 feet from sources of ignition, a property line that can be built upon, control rooms, offices, shops, and other occupied structures.
Marine Transfer Spacing (Title 33 CFR Part 127.105)	This requirement specifies that each LNG unloading flange must be located at least 985 feet from any bridge crossing a navigable waterway.

2.7.1.1 Spill Containment

The LNG impoundment systems for the terminal facilities would be designed and constructed to comply with DOT regulations in Title 49 CFR Part 193 sections 193.2149 through 193.2185. These regulations require that each LNG container and each LNG transfer system be provided with a means of secondary containment that has been sized to hold the quantity of LNG that could be released as a result of the design spill that is appropriate for the area and LNG equipment. The design spills are defined in NFPA 59A.

SES would use spill containment troughs and sump systems in the process area, the trailer truck loading area, and inside the security barrier wall adjacent to the LNG storage tanks to provide containment for a 10-minute spill in accordance with NFPA requirements. The troughs would be concrete lined and graded and curbed so that a spill would flow to the collection sumps. The containment system in the process area would be 35 feet long by 25 feet wide with a depth of 18 feet. The trailer truck loading area containment system would be 10 feet long by 10 feet wide with a depth of 18.8 feet. The containment system for the LNG storage tanks would be 210 feet long by 25 feet wide with a depth of 17.6 feet. Any spills from the unloading lines on the ship unloading facility would be directed towards the LNG storage tank area sump system via a trough from the ship to the sump. The trough from the unloading facility to the sump would be approximately 3 feet wide by 2.8 feet deep, while the trenches in the process area that drain to the process area sump would be approximately 3 feet wide by 1.2 feet deep.

The LNG storage tanks would follow a full containment design capable of containing all of the inner tank contents by the outer tank. The 20-foot-high concrete LNG security barrier wall surrounding the LNG storage tanks would also prevent LNG from leaving the LNG terminal site in the event that both the inner tank and the outer concrete container of the storage tanks fail and spill the entire contents onto the site.

Any storm water collected in the spill containment systems would be routinely pumped to the existing drainage system. The systems would be equipped with automatic level control activators and low-temperature sensors and switches to prevent operation of the pumps in the event of an accidental release of LNG to the sump system.

2.7.1.2 Hazard Detection System

Hazard detectors would be installed throughout the facility to provide operating personnel early detection of releases of flammable gases and fires, to show the general location of a release or fire, to initiate shutdowns of equipment in the affected area, and to initiate discharge of selected fire control systems. The hazard detection system would consist of separate combustible gas, ultraviolet/infrared (UV/IR), smoke, ammonia, and high and low temperature sensor units. These detectors would be integrated into an independent Safety Instrumented System (SIS) that would allow for the safe, sequential shutdown and isolation of rotating equipment, fired equipment, and LNG storage facilities. The detectors would also be hard wired to the main control system for alarm and emergency shutdown.

SES would also install a security video monitoring system. Cameras would monitor the fence line and terminal entry gates, the main gate, administration building, control room building, LNG and NGL process areas, LNG storage tanks, LNG relief valves, trailer truck loading area, and the ship berth and unloading facility. This monitoring system would be used to detect visual evidence of intruders, LNG releases, fires, or other emergencies.

2.7.1.3 Hazard Control System

The project would contain “passive” and “active” hazard prevention and mitigation systems and controls. Passive systems would generally include those that do not require human intervention such as spill drainage and collection systems, ignition source control, and fireproofing. Active systems normally are either automatic or require some action by an operator. Active spill and fire control systems and equipment would consist of:

- a looped, underground firewater distribution piping system serving hydrants, firewater monitors, hose reels, water spray, or deluge and sprinkler systems (see section 2.7.1.4);
- three fixed high expansion foam systems (one for each LNG spill containment system);
- fixed dry chemical systems;
- portable and wheeled fire extinguishers employing dry chemical and CO_2, the latter intended primarily for energized electrical equipment;
- sprinkler systems, as needed; and

- emergency shutdown system activation.

The type of agent that would be used in a specific situation would depend on the characteristics of a particular event and the relative effectiveness of the various agents on that type of fire.

2.7.1.4 Firewater System

A firewater supply and distribution system would be provided for extinguishing fires, cooling structures and equipment exposed to thermal radiation, and dispersing flammable vapors. Hydrants, manual monitors, automatic sweep monitors, and hose reels would be located throughout the LNG terminal. The main components of the system would include:

- a 1.3-million-gallon fresh water storage tank;
- two diesel-driven and two electric-driven fresh water fire pumps;
- numerous firewater monitors, compression-type fire hydrants, and hose reels;
- remote-operated deluge systems for all LNG storage tanks;
- an automatic sprinkler system in the administration and warehouse buildings; and
- an underground/aboveground piping distribution system.

The firewater system is intended to be run on fresh water. The firewater storage tank would be filled and replenished with water supplied from the municipal water system and would have capacity for at least 2 hours of continuous pumping. The firewater pumps would be designed and installed in accordance with NFPA 20.

2.7.1.5 Fail-Safe Shutdown

The LNG terminal facilities would have the following three levels of emergency shutdown:

- Level 1 - A manual emergency shutdown (ESD) system that would be used for a major incident and would result in a total plant shutdown. This system would be manually activated via hard-wired ESD buttons located in the main control room, main security gate entrance, process area, and the control rooms on the unloading platforms.

- Level 2 - An automatic and manual ESD system that would shut down the unloading facility. This system would be activated manually, automatically by programmable instrumentation, by a Level 1 shutdown, or from ship-to-shore operations.

- Level 3 - Individual pieces of equipment would be shut down automatically via the SIS as the result of signals from various detectors and sensors located throughout the facilities.

2.7.1.6 Security System

Security at the facility would be provided by both active and passive systems. The entire site would be surrounded by a protective fence and the LNG storage tanks and process area would be surrounded by a 20-foot-high concrete barrier wall. The site would be illuminated between sunset and sunrise. As stated in section 2.7.1.2, SES would install a security video monitoring system to monitor the fence line and other components of the facility. As stated in section 4.11.8, SES would be required to hire a separate 24-hours-per-day security staff and coordinate with the Coast Guard to define the responsibilities of this staff in supplementing other security personnel and in protecting the LNG ships and terminal.

SES' proposed systems would be outlined in the Facility's Security Plan in accordance with Title 33 CFR Part 105 and must be approved by the Coast Guard before operations. In completing the Facility Security Plan, SES would conduct a Facility Security Assessment that examines and evaluates the infrastructure and operations of the facility taking into account possible threats; vulnerabilities; consequences; and existing protective measures, procedures, and operations. From this analysis, SES would develop a plan to ensure the application of security measures designed to protect the facility and its servicing vessels or those vessels interfacing with the facility, their cargoes, and persons on board at the respective Maritime Security (MARSEC) levels. The Coast Guard's MARSEC level increases with the threat level and also relates to the Department of Homeland Security's Homeland Security Advisory System levels. In particular, the plan must identify the Facility Security Officer (FSO) by name and position, provide 24-hour contact information, address each vulnerability identified in the Facility Security Assessment, and describe security measures for each MARSEC level.

The Facility Security Plan would be prepared in close coordination with the FERC, the DOT's OPS, and state and local law enforcement offices for Coast Guard approval. The plan would establish a written program for physical security for the entire LNG terminal facility. The plan would provide for MARSEC levels of security carried out by trained personnel during all operations and, if necessary, to respond to serious threats. Additional discussion of the Facility Security Plan is presented in section 4.11.8.

In addition to the Facility Security Plan, SES would be required to develop a Waterway Suitability Assessment (WSA) that will determine the appropriate safety and security measures to mitigate the risks while the LNG ship is operating in the vessel traffic service (VTS) area. SES is currently working with the Coast Guard and state and local officials to develop the WSA. Once the WSA is developed, it will be validated and approved by the Coast Guard. Additional discussion of the WSA is presented in section 4.11.7.4.

2.7.2 Natural Gas and C_2 Pipelines and Associated Aboveground Facilities

The pipelines and aboveground facilities associated with the Long Beach LNG Import Project would be designed, constructed, operated, and maintained in accordance with DOT Minimum Federal Safety Standards in Title 49 CFR Part 192. These safety standards are discussed in section 4.11.12.1.

2.7.2.1 Corrosion Protection and Detection Systems

A cathodic protection system would be installed to prevent or minimize corrosion and to mitigate alternating current interference from the overhead electric distribution lines. The interior of the pipe would be periodically monitored for corrosion using internal corrosion probes and/or in-line pigging tools.

2.7.2.2 Emergency Response Procedures

Pipeline system emergencies can include gas leaks, fire or explosion, and/or damage to the pipeline and aboveground facilities. In accordance with DOT regulations, the operating company would develop a new emergency plan or revise its existing plan to address procedures to be followed in the event of an emergency along the pipeline. This plan would include training of employees on emergency procedures; establishing liaisons with appropriate fire, police, and other community officials; and informing the public on how to identify and report an emergency condition on the pipeline route. Additional discussion of the emergency plan for pipeline facilities is presented in section 4.11.12.1.

2.8 FUTURE PLANS AND ABANDONMENT

SES has no future plans for expansion or abandonment of the proposed facilities. Any future expansion would require additional FERC and POLB authorizations and appropriate environmental analyses. Any future abandonment would be subject to appropriate federal, state, and local regulations in effect at that time.